Captain Watson, of the ship *Charles Bal*, at a spot about a dozen miles off the island, records the phenomena of chains of fire appearing to ascend between the volcano and the sky, while on the south side there seemed to be a "continual roll of balls of white fire." These appearances were doubtless caused by the discharge of white-hot fragments of lava rolling down the sides of the mountain. From midnight till 4 a.m. explosions continually took place, the sky one second being intense blackness, the next a blaze of fire.

All the eye-witnesses agree as to the splendour of the electrical phenomena. Captain Woolridge, viewing the eruption from a distance of 40 miles, speaks of the great vapour cloud resembling an immense wall, with outbursts of fork lightning, like large luminous serpents, rushing through the air. After sunset, this dark wall assumed the appearance of a blood-red curtain, with the edges of all the shades of yellow—the whole of a murky tinge, and attended with fierce flashes of lightning. It was reported from the *Loudon* that lightning struck the mast-head conductor five or six times, and that the mud-rain which covered the masts, rigging, and decks was phosphorescent. The rigging presented the appearance of St. Elmo's fire, which the native sailors were busily engaged putting out with their hands, alleging that, if any portion found its way below, a hole would burst in the ship; not that they feared the ship taking fire, but they thought the light was the work of evil spirits, and that if it penetrated the hold of the vessel, the evil spirits would triumph in their design to scuttle the ship.

By these grand explosive outbursts the old crater of Krakatão was completely eviscerated, and a cavity formed more than 1000 feet in depth; while the solid materials thrown out from the crater were spread over the flanks of the volcano, forming considerable alterations in their forms.

The sea disturbance which accompanied the eruption of Krakatão was carefully investigated by Captain Wharton, Hydrographer to the Admiralty:—"The rush of the great sea wave over the land, caused by the violent abrasion in the crater, aided by the action on the water of enormous masses of fallen material, caused great destruction of life and poverty in the Straits of Sunda. By the inrush of these waves on land, all vessels near the shore were stranded, the towns and villages near the coast devastated, two of the lighthouses were swept away, and the lives of 36,380 of the inhabitants sacrificed. It was estimated that the wave was about 50 feet in height when it broke on the shore."

On the morning of the 27th, between 10 and 11 a.m., three vessels at the eastern entrance of the Straits encountered the fall of mingled dust and water, which soon darkened the air, and covered their decks and sails with a thick coating of mud. Some of the pieces of pumice falling on the *Sir R. Sale* were said to have been of the size of a pumpkin. All day on the 27th, the three vessels were beating about in darkness, pumice-dust falling upon them in such quantities as to employ the crew for hours in shovelling it from the decks and in beating it from the sails and rigging. At Batavia, 100 miles from Krakatão, the sky was clear at 7 a.m., but at 11 a.m. there fell a regular dust-rain; at 11.20 complete darkness pervaded the city. The rain of dust continued till 1, and afterwards less heavily till 3 p.m.

The speed and distance attained by the pumice ejected from the volcano may be conceived from the fact stated in Mr. Douglas Archibald's contribution to the Report, that dust fell on September 8, more than 3700 English miles from the seat of the eruption.

The great mass of the pumice thrown out during the eruption presented a dirty greyish-white tint, being very irregular in size. It was undoubtedly due to the collision of fragments of pumice as they were violently ejected from the crater; the noise produced was even more striking than the sound of the explosion.

The dust ejected from Krakatão did not all fall back at the same time upon the sea and earth; as the lightest portions formed into a haze, which was propagated mostly westward. Mr. Archibald states in the Report that most observers agree upon considering this haze as the proximate cause of the twilight glows, coloured suns, and large corona, which were seen for a considerable time after the eruption. The haze was densest in the Indian Ocean and along the equatorial belt, and was often thick enough to hide the sun entirely when within a few degrees from the horizon.

And now, ladies and gentlemen, I must bring this address to a conclusion, and thank you for having followed me over a long, dusty track. I hope I have succeeded in showing that infinitely small objects, no larger than particles of dust, act important parts in the physical phenomena of Nature, just as small and apparently unimportant events occasionally lead to others of the greatest magnitude.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, March 6.—"The Cranial Nerves of the Torpedo" (Preliminary Note). By J. C. Ewart, M.D. Communicated by Prof. M. Foster, Sec. R.S.

The cranial nerves of the torpedo agree in their general arrangement with those of the skate.[1] The ophthalmicus profundus occupies the usual position, but its ganglion lies in close contact with the Gasserian, and not on a level with the ciliary, ganglion. The trigeminus has the usual distribution, for, notwithstanding the statements in the most recent text-books,[2] the trigeminus sends no branch to the electric organ. The facial complex includes the superficial ophthalmic, the buccal, and the hyomandibular nerves, all of which have the same distribution as the corresponding nerves in the skate; but the hyomandibular includes or is accompanied by a large bundle of nerve fibres which supply the anterior and inner portion of the electric organ. This large nerve cord (the first electric nerve) has hitherto almost invariably[3] been described as a branch of the trigeminus. When traced backwards, it is found to spring from the anterior portion of the electric lobe.

The glossopharyngeus, a slender nerve in the skate, is represented in the torpedo by a thick cord which escapes by a large foramen in the outer wall of the auditory capsule. This large nerve consists of two portions, one of which is small and completely covered by the large superficial division. The small deep division, which in its course and distribution closely resembles the glossopharyngeal in the skate, presents on leaving the auditory capsule a distinct ganglionic swelling, beyond which it breaks up into the branchial and other branches. The large superficial division emanates from the electric lobe behind the origin of the first electric nerve, and at once runs outwards to reach and supply the majority of the columns of the anterior half of the electric organ.

The vagus complex consists of the nervus lateralis, the nervus intestinalis, and of five branchial nerves, of which the two anterior are accompanied by the third and fourth electric nerves. The nervus lateralis, lying superficial to all the other nerves, arises on a level with the root of the glossopharyngeus, and then curves backwards dorsal to the posterior electric nerve to reach the canal of the lateral line. Shortly after leaving the cranium it presents a distinct ganglionic swelling, which is crowded with large cells. The four branchial nerves for the four vagus branchiæ, the slender filament which represents a sixth branchial nerve, and the intestinal nerve lie at first in contact with each other under cover of the third and fourth electric nerves. When the branchial and intestinal nerves are carefully examined, they are found to present four, sometimes five, ganglionic enlargements, and in addition ganglionic cells can sometimes be detected at the proximal end of the slender sixth branchial nerve. The third and fourth electric nerves lie over and are especially related to the second and third branchial nerves. These large electric nerves spring from the posterior half of the electric lobe, and find their way outwards partly behind and partly under the auditory capsule, to terminate in the posterior half of the electric organ.

It thus appears that all the electric nerves spring from the electric lobe, that the first accompanies the hyomandibular division of the facial complex, the second the glossopharyngeus, and the third and fourth the first two branchial nerves of the vagus complex. It remains to be seen whether the electric nerves have been derived from motor branches of the nerves with which they are respectively associated by an enormous increase in the number of their fibres, as the muscular fibres were gradually transformed into electric plates.

Physical Society, Feb. 21.—Prof. G. Carey Foster, F.R.S., Past-President, in the chair.—The following communications were read:—On a carbon deposit in a Blake telephone transmitter, by Mr. F. B. Hawes. The author exhibited photographs of the interior portions of the transmitter on which the deposit had taken place. These portions consist of a metal diaphragm, a highly-polished carbon button, and a platinum contact piece carried by a German silver spring placed between them. The diaphragm presented a mottled appearance due to the deposit, but the part which had been behind the German silver spring seemed comparatively clean. The deposits on the carbon button and German silver spring were much less dense than that on the exposed parts of the diaphragm, and the space near the point of contact between the platinum and carbon was free from deposit. The deposit was fairly adherent, some rubbing being necessary to remove it, and on examination under the microscope particles of copper and metallic crystals could be seen. The author believes the deposit due to some kind of bombardment of carbon particles, but was unable to say why it should occur, or why the varnished diaphragm should receive the greater deposit although it was further from the carbon than the German silver spring. Mr. C. V. Boys said the photographs reminded him of a phenomenon he observed some time ago on a glass sheet against which one terminal of a dry pile had been resting for some weeks. Just as on the carbon button, the glass near the point of contact was clean and had a comet-shaped deposit formed around it. He could offer no explanation of the appearance.—The geometrical construction of direct-reading scales for reflecting galvanometers, by Mr. A. P. Trotter. In a recent paper on galvanometers, by Prof. W. E. Ayrton, F.R.S., T. Mather, and Dr. W. E. Sumpner, read before the Society, the opinion was expressed that proportionality of scale reading to current was very desirable, and the present paper shows how to bend a scale of equal divisions so as to give the required proportionality. Suppose the currents required to produce several deflections have been experimentally determined. A full-size plan of the scale is then drawn, and radial lines from the points on the scale at which the observations were taken are drawn towards the centre of the mirror. Let these radii be numbered 0, 1, 2, 3, &c., commencing from zero azimuth. According to the procedure recommended, distances proportional to the several current strengths are marked off along the edge of a strip of paper, a few inches being left over at each end. Call the marks *a*, *b*, *c*, *d*, &c., *a* being the zero point. Two points on the radii 0, 1, and equidistant from the mirror are now found such that the distance between them is equal to that between *a* and *b* on the strip, and the points marked by fine needles stuck in the board. The zero end of the strip is now fixed so that the marks *a* and *b* lie against the needles, and the strip is swept round until the mark *c* coincides with the radius 2, where also a needle is placed. Repeating the process gives a series of points which on being joined form part of a polygon. A line can then be drawn between the inscribed and circumscribing curves which has the same length as the sum of the straight lines, and this is the curve to which the original scale may be bent so as to give proportional readings. Diagrams showing such curves, constructed from the calibrations of instruments given in the paper above referred to, accompany the paper. The author showed that a family of curves may be drawn, each of which satisfies the required condition. Of the two limiting curves, one is tangential to the usual scale line at zero azimuth, and the other passes through the vertical axis of the mirror. The flattest of the various curves is generally the most convenient. Mr. J. Swinburne asked whether good definition could be obtained when such curved scales not equidistant from the mirror were used, and also whether it was not easier to divide a flat scale unequally so that the readings are proportional to the current. Mr. Trotter, in reply, said Dr. Sumpner thought there would be no difficulty as regards definition with the flat curves shown. He (Mr. Trotter) also added that a curved scale might be advantageous in reading the deflections from one side of a table, as the more distant part of the scale could be more nearly perpendicular to the line of sight. For such an arrangement, however, a parallel beam of light would be required.—A parallel motion suitable for recording instruments, by Mr. A. P. Trotter. This is a modification of Watt's parallel motion, in which the two fixed centres are on the same side of the line described by the "parallel point." The arrangement consists of two vibrating arms, one of which is twice the length of the other, and whose outer ends are jointed respectively to the middle and end of a short lever; the free end of the latter describes an approximate straight line. The motion was arrived at by considering the curve traced out by a point on the radius of a circle, such that its distance from the circumference measured towards the centre is equal to the radial intercept between the circle and a tangent line. The equation to the curve is $r = 2 - \sec\theta$ (conchoid of Nicomedes) and the radius of the osculating circle at the point where the intercept is zero is given as half that of the initial circle. This osculatory circle, the author finds, practically coincides with the curve over a considerable angle (40°), and thus may replace this part of the curve; hence the motion. The author thinks the motion will be useful for recording barometers, ammeters, and voltmeters, as it is more compact than that of Watt, and needs no fixed point beyond the straight path.—Owing to the absence of Prof. S. P. Thompson, his paper on Bertrand's refractometer was not read.

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[1] Ewart, "On the Cranial Nerves of Elasmobranch Fishes," Roy. Soc. Proc., vol. 45, 1889.

[2] *E.g.*, McKendrick, "Text-book of Physiology," 1888, and Wiedersheim, "Grundriss der vergleichenden Anatomie," 1888.

[3] Fritsch is the only author I am acquainted with who does not describe the first electric nerve as a branch of the trigeminus, "Untersuchungen ueber den feineren Bau des Fischgehirns," Berlin, 1878.

Linnean Society, March 6.—Mr. Carruthers, F.R.S., President, in the chair.—Mr. Thomas Christy exhibited a dried specimen of *Picramnia antidesma*, the plant from the bark of which a medicine, known as *cascara amarya*, a useful alterative in diseases of the blood and skin, is believed to be prepared.—Mr. J. E. Harting exhibited a series of horns of the American Prongbuck (*Antilocapra americana*), to illustrate the mode in which the shedding and new growth of horn is effected in this animal.—A paper was read by Mr. D. Morris, on the production of seed in certain varieties of the sugar-cane (*Saccharum officinarum*). It was pointed out that, although well known as a cultivated plant, the sugar-cane had nowhere been found wild; nor had the seed (*caryopsis*) been figured or described; it being the generally received opinion that, having been propagated entirely by slips, or cuttings, it had lost the power of producing seed. Spikelets, however, received at Kew, had been carefully examined, and the seed found, which was now for the first time exhibited by Mr. Morris. He anticipated that, by cross-fertilization and selection of seedlings, the sugar-cane might be greatly improved, and much importance was attached to the subject, as it opened up a new field of investigation in regard to sugar-cane cultivation. Mr. J. G. Baker and Mr. Christy concurred.—A paper was then read by Mr. Spencer Moore, on the true nature of *callus*; Part 1, the vegetable-marrow and *Ballia callitricha*. It was shown that the *callus* of sieve-tubes of the vegetable-marrow gives marked proteid reactions; and since it is dissolved in a peptonizing fluid there can be no doubt of its being a true proteid, and not a kind of starchy mucilage, as is usually supposed. The "stoppers" of *Ballia* also yield proteid reactions, but inasmuch as they resist gastric digestion, the substance cannot be a true proteid, and may perhaps be allied to lardacein. Mr. Moore maintained the view of Russow, Strassburger, and others—that *callus* is deposited upon the sieve—to be correct in the case of the vegetable-marrow; since a peptonizing fluid clears the sieve-plates and leaves them in their pristine condition, which would not be the case if *callus* were formed by a swelling up of the sieves. A discussion followed, in which Dr. F. W. Oliver, Dr. D. H. Scott, Prof. Reynolds Green, and Mr. George Murray took part.

Zoological Society, March 4.—Prof. W. H. Flower, F.R.S., President, in the chair.—The Secretary read a report on the additions that had been made to the Society's Menagerie during the month of February 1890.—Mr. F. E. Beddard exhibited and made remarks on some living specimens of an Indian Earthworm (*Perichæta indica*), obtained from a greenhouse in Scotland.—Mr. A. Thomson exhibited a series of insects reared in the Insect House in the Society's Gardens during the past year, and read a report on the subject. Particular attention was called to specimens of a South African Mantis (*Harpax ocellata*) and of a Canadian Stick Insect (*Diaphemora femorata*).—Mr. Henry Seebohm read a paper on the classification of birds, being an attempt to diagnose the sub-classes, orders, sub-orders, and some of the families of existing birds. The characters upon which the diagnoses were based were almost entirely derived from points in the osteology, myology, and the pterylosis of the groups diagnosed.—A communication was read from Mr. T. D. A. Cockerell, describing some Galls from Colorado, of which specimens were transmitted for exhibition.

Edinburgh.

Royal Society, February 28.—Sir Douglas Maclagan, Vice-President, in the chair.—Prof. Rutherford communicated a paper on the structure and contraction of striped muscular fibre of crab and lobster.—Prof. Haycraft read a paper on the histology, functions, and development of the carapace of the Chelonia, and also another paper on the rate at which muscles contract when the motor paths are stimulated by interrupted electrical currents.

March 3.—Sir W. Thomson, President, in the chair.—Prof. Tait communicated a note on ripples in a viscous liquid. He investigates in it the motion of a continuous set of ripples, and discusses the effects of gravity, surface-tension, surface-stiffness, and viscosity.—Dr. Thomas Muir communicated a paper by Mr. D. Maver, on a geometrical method based on the principle of translation.—Prof. J. Stuart Blackie read a paper on the phases of the living Greek language.

PARIS.

Academy of Sciences, March 10.—M. Hermite in the chair.—Note on the life and works of George Henry Halphen, by M. Emile Picard.—On the phenomena seen about the sun on March 3, 1890, by M. A. Cornu. Halos and parhelia were seen about the sun on this date, and observations of the aqueous bands of the solar spectrum made at the time when the first halo of 22° appeared, showed that warm and moist currents existed in the higher regions of the atmosphere in spite of the exceptional cold (– 11° C.) at Paris.—Thermal researches on the allotropic modifications of arsenic, by MM. Berthelot and Engel. The amount of heat evolved on treatment with bromine and water was found to be nearly the same in both the forms; arsenic, in this respect, behaving like carbon.—Second note on the absorption of atmospheric ammonia by soils, by M. H. Schlœsing. From the experiments described in this and the previous note, the author finds that calcareous, acid or neutral, dry or wet soils, absorb atmospheric ammonia. Moist earth, however, favours the fixation of ammonia, and dry earth retards it.—The muscular and elastic elements of the retrolingual membrane of the frog, by M. L. Ranvier. The problems investigated are: the attachment of the elastic fibres to the muscular bundles, and whether a fibril terminates in a thick or thin disc or a clear space, all of which occur in the muscular bundles.—On the microbes of acute osteomyelites called infectious, by MM. Lannelongue and Achard.—Study of the errors of observation, by M. J. E. Estienne.—Sun-spot in very high latitude, by M. Dierckx. To this note we refer elsewhere (p. 472).—On Stirling's formula, by M. E. Rouché.—On regular surfaces which pass through a given curve, by M. Ch. Bioche.—On the compounds of phosphoretted hydrogen and ammonia with boron chloride and silicon hexachloride, by M. A. Besson.—Note on the compounds of the metals of the alkalies with ammonia, by M. J. Moutier.—On the estimation of free halogens and of iodides in presence of chlorine and bromine, by M. P. Lebeau. Iodine is estimated by liberation from its compound in aqueous solution by a standard solution of bromine, the iodine being dissolved out from the water by CS_2 as soon as liberated: the end of the reaction is indicated by the decoloration of the supernatant aqueous solution, to which a few drops of indigo solution has been previously added.—On the formation of thiosulphate of lead, note by M. J. Fogh.—Decomposition of thiosulphate of lead by heat. Trithionate of lead, by the same author. It is shown that, by the prolonged action of boiling water, thiosulphate of lead decomposes according to the equation $2PbS_2O_3 = PbS + PbS_3O_6$.—On a new iodide of bismuth and potassium, M. L. Astre.—Note on the molecular increase of dispersion of saline solutions, by MM. Ph. Barbier and L. Roux. If the constant K given in a previous communication be multiplied by the molecular weight of the dissolved salt, what the authors term the molecular increase of dispersion is obtained. MK for chlorides of the type MCl is shown to have the mean value 0·020, for chlorides MCl_2 the mean value is 0·044.—Researches upon the application of measurements of the rotatory power to the determination of compounds resulting from the action of malic acid upon the neutral molybdates of lithium and magnesium, by M. D. Gernez.—The volumetric estimation of tannin, by M. E. Guenez.—Estimation of acetone in methyl alcohol and in the raw methyl alcohol used for methylation, by M. Léo Vignon.—On the diminution of fermenting power of the ellipsoidal wine-yeast, in presence of salts of copper, by M. A. Rommier.—On a Coleopterous insect attacking the vine in Tunis (*Ligniperda francisca*, Fabricius), by M. A. Laboulbène.—The preparation of crystallized basic nitrate of copper and its identification with gerhardtite, by M. L. Bourgeois.

BERLIN.

Meteorological Society, February 11.—Prof. Schwalbe, President, in the chair.—Dr. Danckelmann spoke on the meteorological conditions which exist on the Gold and Slave Coast. General observations had been started in New Guinea, but were soon reduced to observations of rainfall only; during the years 1886 to 1889, they had yielded some interesting results on the connection between rainfall and the direction of the monsoons and trade-winds. No trustworthy data are as yet to hand of the meteorological conditions of Southern Africa, Cameroon, and East Africa, but, on the other hand, there is a mass of material accumulated at many stations on the Guinea coast. From the latter it appears that the atmospheric pressure varies but slightly, and shows a maximum in July and August. In Bismarckburg the wind blows from the north and north-east from the Sahara in December, January, and February; in June, July, and August it blows west and south-west. Variations of temperature are but slight, presenting a maximum in December to February, and a minimum in July and August. The amount of rainfall is very variable, being, in some places, as low as 575 mm. per annum; in others, 1000, 1500, or even 3500. The speaker concluded by describing the climatic conditions of this region, pointing out that they may be explained with reference to the contiguity of the Sahara Desert.—Dr. Eschenhagen gave a detailed description of the Magnetic Observatory at Potsdam, dealing with its structural arrangements and the internal location of the instruments. While exhibiting the photographically recorded curves of the previous fortnight, he dealt with the breaks in these which result from any more than usually severe shock of earthquake. These he attributed to purely mechanical causes rather than to magnetic, basing his views on observations of the movement of the surface of mercury at the time. He pointed out that the opposite view, urged by French meteorologists, as based upon observation of a copper rod with a bifilar suspension, is inconclusively supported by such observations, inasmuch as the equilibrum of a copper rod is relatively stable, while that of a bifilar magnet is unstable.—The President referred, in conclusion, to the loss which meteorology had sustained in the death of Buys Ballot.

Physiological Society, February 14.—Prof. du Bois Reymond, President, in the chair.—Prof. Zuntz gave an account of experiments conducted in his laboratory by Dr. Katzenstein, on the influence of bodily labour on the metabolism of man. After giving an historical *résumé* of previous researches, he described the methods employed in the present research. The experiments were conducted in a very convenient form of respiration-apparatus, the analysis of the gases being made by Hempel's method. Great stress was laid on the accurate determination of the work done; the latter consisted in either turning a wheel against a graduated resistance, or else in motion on either a plane or inclined surface. In the latter form of work an apparatus was used which had previously been employed in experiments on a horse. The oxygen consumed in each experiment was taken as a measure of the metabolism. It was found that this was permissible, from the fact that the respiratory quotient was observed to be constant during the three conditions of rest, walking, and climbing. From this it appeared that the energy required for any given work was the outcome of the union of oxygen and carbon in the formation of carbonic acid gas. The increased respiratory interchange which accompanied any extra work fell to the normal some two or three minutes after the work ceased. In each experiment the distance covered and height through which the body was raised was measured in kilogram-metres; the oxygen simultaneously absorbed was determined, and from this the amount of oxygen which would have been absorbed if no work had been done was subtracted, so that the amount of oxygen required for the given work was obtained. It was found that, as in Smith's experiments, the metabolism might be increased to two or three times the normal during work. The experiment was then repeated, employing a different rate of motion and steepness of ascent, so that it was readily possible to calculate the oxygen, in cubic centimetres, required for a progression of one metre or the raising of one kilogram; the former was then reduced to a unit of one kilogram of body-weight. The result obtained from the person on whom most of the experiments were made was that the moving of one kilogram of body-weight over one metre of space on the level involved a consumption of 1·11 c.c. of oxygen, and for the raising of one kilogram through one metre, a consumption of 1·438 c.c. In conclusion, the speaker drew some interesting comparisons between the results of these experiments and those previously made on a horse.—Dr. Benda exhibited several preparations of sense-organs of mammals; and Dr. Katz showed some specimens of the organ of Corti.—Dr. Hausemann spoke on unsymmetrical karyokinesis met with in epitheliomata. Ordinarily the chromatin-filaments divide into two equal parts, but in cancer-cells they do not, and from this results the polymorphism of the nuclei.

Physical Society, Febuary 21.—Prof. du Bois-Reymond, President, in the chair.—Prof. von Bezold made a short speech in memory of Buys Ballot, pointing out with chief prominence that he was the first to draw attention to the necessity of co-operation between the meteorologists of different nations, and that he had been chiefly instrumental in establishing the existing International Meteorological Congress. He further showed that Buys Ballot was the first to give a survey of the meteorological conditions existing simultaneously at different places on the earth's surface, the pioneer in the production of the synoptic charts which are now published (see *Poggendorff's Annalen* for 1847), and the first to thoroughly grasp and state with precision the difference between weather and climate.—Dr. E. Pringsheim spoke on Kirchoff's law and gaseous radiation. During the experimental verification of the above, the speaker was chiefly interested in the behaviour of gases and vapours, and selected for his experiments sodium vapour. It was impossible to obtain any answer to the question "Does a gas acquire the power of emitting light-rays when its temperature is raised?" by the mere introduction of sodium or its salts into the non-luminous flame of a Bunsen burner, since it was not possible to exclude the occurrence of chemical changes during such an experiment. Thus he employed rather the method of Lockyer, Liveing, and Dewar, heating the metal in a sealed tube. In this way he verified the appearance of the bright emission-line and of the absorption-line of sodium. The lowest temperature at which they make their appearance was determined and measured thermo-electrically, but the speaker did not deduce any absolute value from his data. He further considered that the radiation of gases when heated is not yet definitely proved, since the nitrogen in which he heated the sodium contained minute traces of oxygen, and the method he employed for closing the ends of his tube permitted of the probable entry of small quantities of air. He had, therefore, additionally made experiments with thallium, and on the introduction of air into the metallic vapours; these experiments yielded a distinctly affirmative answer to the original question, but require further extension. So also do some experiments on the occurrence of a fluted spectrum of sodium, which the speaker had made during the course of the above work.

DIARY OF SOCIETIES.

LONDON.

THURSDAY, MARCH 20.

ROYAL SOCIETY, at 4.30.—The Bakerian Lecture—On the Discharge of Electricity through Gases: Prof. A. Schuster, F.R.S.

LINNEAN SOCIETY, at 8.—The External Morphology of the Lepidopterous Pupæ; Part 2, the Antennæ and Wings: E. B. Poulton, F.R.S.—On the Intestinal Canal of the Ichthyopside with especial Reference to its Arterial Supply: Prof. G. B. Howes.

CHEMICAL SOCIETY, at 8.—The Evidence afforded by Petrographical Research of the Occurrence of Chemical Change under Great Pressures: Prof. Judd, F.R.S.

ZOOLOGICAL SOCIETY, at 4.

INSTITUTION OF ELECTRICAL ENGINEERS, at 8.

ROYAL INSTITUTION, at 3.—The Early Developments of the Forms of Instrumental Music (with Musical Illustrations): Frederick Niecks.

FRIDAY, MARCH 21.

PHYSICAL **SOCIETY**, at 5.—On the Villari Critical Point of Nickel: Herbert Tomlinson.—On Bertrand's Idiocyclophanous Prism: Prof. Silvanus Thompson.

INSTITUTION OF CIVIL ENGINEERS, at 7.30.—Economy Trials of a Compound Mill-Engine and Lancashire Boilers: L. A. Legros.

ROYAL INSTITUTION, at 9.—Electro-magnetic Radiation: Prof. G. F. Fitzgerald, F.R.S.

SATURDAY, MARCH 22.

SOCIETY OF ARTS, at 3.—The Atmosphere: Prof. Vivian Lewes.

ROYAL BOTANIC SOCIETY, at 3.45.

ROYAL INSTITUTION, at 3.—Electricity and Magnetism: Right Hon. Lord Rayleigh, F.R.S.

MONDAY, MARCH 24.

ROYAL GEOGRAPHICAL SOCIETY, at 8.30.—North American Trans-Continental Pathways, Old and New: Augustus Allen Hayes.

SOCIETY OF ARTS, at 8.—Some Considerations concerning Colour and Colouring: Prof. A. H. Church, F.R.S.

TUESDAY, MARCH 25.

ANTHROPOLOGICAL INSTITUTE, at 8.30.—Exhibition of a Skull, dredged up on the Manchester Ship Canal Works: Isidore Spielman.—The Old British "Pibcorn," or "Hornpipe." and its Affinities: Henry Balfour.—The Ancient Peoples of Ireland and Scotland considered: Hector Maclean.

SOCIETY OF ARTS, at 8.—Engraving in Wood, Old and New: W. J. Linton.

INSTITUTION OF CIVIL ENGINEERS, at 8.—Lough Erne Drainage: James Price, Jun. (Discussion.)—Barry Dock and Railway: John Robinson.

ROYAL INSTITUTION, at 3.—The Post-Darwinian Period: Prof. G. J. Romanes, F.R.S.

WEDNESDAY, MARCH 26.

GEOLOGICAL SOCIETY, at 8.—On a New Species of Cyphaspis from the Carboniferous Rocks of Yorkshire: Miss Coignou. Communicated by Prof. T. McKenny Hughes, F.R.S.—On Composite Spherulites in Obsidian from Hot Springs near Little Lake, California: F. Rutley.—A Monograph of the Pryozoa (Polyzoa) of the Hunstanton Red Chalk; G. R. Vine. Communicated by Prof. P. Martin Duncan, F.R.S.—Evidence furnished by Quaternary Glacial-Epoch Morainic Deposits of Pennsylvania, U.S.A., for a Similar Mode of Formation of the Permian Breccias of Leicestershire and South Derbyshire: W. S. Gresley.

SOCIETY OF ARTS, at 8.—Carriage-Building and Street Traffic in England and France: G. N. Hooper.

THURSDAY, MARCH 27.

ROYAL SOCIETY, at 4.30.—The following papers will *probably* be read:—On Black Soap-films: Profs. Reinold and Rücker, F.R.S.—The Variability of the Temperature of the British Isles, 1869–83 inclusive: R. H. Scott, F.R.S.—Preliminary Note on Supplementary Magnetic Surveys of Special Districts in the British Isles: Profs. Rücker and Thorpe, F.R.S.—The Rupture of Steel by Longitudinal Stress: C. A. Carus-Wilson.—Measurements of the Amount of Oil necessary in order to check the Motion of Camphor upon Water: Lord Rayleigh, Sec.R.S.—On the Stability of a Rotating Spheroid of Perfect Liquid: G. H. Bryan.—A Determination of ν, the Ratio of the Electromagnetic Unit of Electricity to the Electrostatic Unit: Prof. J. J. Thomson, F.R.S., and G. F. C. Searle.

CHEMICAL SOCIETY, at 4.—Anniversary Meeting.—Election of Office-Bearers and Council.

INSTITUTION OF ELECTRICAL ENGINEERS, at 8.

ROYAL INSTITUTION, at 3.—The Early Development of the Forms of Instrumental Music (with Musical Illustrations): Frederick Niecks.

FRIDAY, MARCH 28.

INSTITUTION OF CIVIL ENGINEERS, at 7 30.—Deflection of Spiral Springs: Alfred E. Young.

ROYAL INSTITUTION, at 9.—Foam: Right Hon. Lord Rayleigh, F.R.S.

SATURDAY, MARCH 29.

SOCIETY OF ARTS, at 3.—The Atmosphere: Prof. Vivian Lewes.

ROYAL INSTITUTION, at 3.—Electricity and Magnetism: Right Hon. Lord Rayleigh, F.R.S.

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